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CURRICULUM VITAE

Philip J. O'Keefe, PE

EXPERTISE

Specializing in Intellectual Property, Product Liability, Personal Injury, and Professional Malpractice Matters Involving:

- Medical Devices
- Consumer and Industrial Electronic Products
- Electric Power Tools
- Gasoline Engine Powered Tools
- Turf Care Equipment
- Hand Tools
- Electrical Appliances
- Water Filtration Systems
- Manufacturing Processes and Equipment
- Electric Utility Power Plants
- HVAC Systems
- Process Control Systems and Safety Interlocks
- Railway Equipment and Operations
- Quality Control
- Regulatory Compliance

EDUCATION

BS Mechanical Engineering - Illinois Institute of Technology, Chicago, Illinois, 1981

MS Electrical Engineering - Iowa State University, Ames, Iowa, (enrolled)

PROFESSIONAL REGISTRATION

Registered Professional Engineer, State of Illinois, License No. 62-058772

Registered Professional Engineer, State of Minnesota, License No. 45527

Model Law Engineer, National Council of Examiners for Engineering and Surveying, Cert. No. 29725

INVENTIONS

Patent No. US 6,623,184 - Low Cost, Upgradeable, Deep Tank Automated X-Ray Film Processor

Patent Application Publication No. US2009/0066486A1 – Modular Signal Device For A Room Occupancy Management System And A Method For Using Same

CERTIFICATIONS

- Basic Instructor - Commonwealth Edison Company, Production Training Department
- Advanced Instructor – Commonwealth Edison Company, Production Training Department
- Problem Solving, Decision Making and Planning Program Instructor – Business Processes, Inc.
- Kepner-Trego Problem Solving/Decision Making Instructor – Kepner-Trego, Inc.
- Systematic Trouble Shooting Instructor – Business Processes, Inc.
- Fossil Power Plant Simulator Training Instructor – Autodynamics, Inc.
- Qualified Vibration Analyst – IRD Mechanalysis, Inc.

PROFESSIONAL EXPERIENCE

North Star Ideations, LLC – Winona, MN 2009 to Present
PRESIDENT

Develop, design, and test digital and analog electronics, embedded systems, and mechanical components for medical device, industrial, and consumer product innovations.

EngineeringExpert.net, LLC – Winona, MN 2000 to Present
PRESIDENT

Provide engineering expert witness and forensic engineering services in legal matters involving intellectual property, product liability, personal injury, and professional malpractice. Provide product development and intellectual property consulting to businesses and inventors. Provide technical training services.

Omni Engineering Services, Inc. – Winona, MN 2006 to 2009
CONSULTING ENGINEERING MANAGER

Developed, designed, and tested digital and analog electronics, embedded systems, industrial control system logic, and mechanical components for the food, consumer product, medical device, transportation, utility, HVAC, and agricultural equipment industries. Managed intellectual property and regulatory compliance matters.

Fischer Industries, Inc. – Geneva, IL 2000 to 2004
DIRECTOR OF ENGINEERING

Developed, designed, and tested new medical devices and accessories, improved existing products, managed quality control, and maintained regulatory compliance.

Echo Incorporated – Lake Zurich, IL/Cape Coral, FL 1997 to 2000
MANAGER OF DEVELOPMENT AND TESTING

Developed, designed, and lab tested gasoline and electric outdoor power tools, improved existing products, managed quality control, and maintained regulatory compliance at the Lake Zurich corporate headquarters. Concurrently managed the Cape Coral prototype product field testing facility.

Richard M. Hansen and Associates – Lombard, IL 1996 to 1997
FORENSIC ENGINEER

Examined, analyzed, photographed, and documented evidence collected at fire scenes.

Karps, Inc. – Elk Grove Village, IL 1995 to 1997
PLANT ENGINEER

Designed machine elements, tooling, and automated control systems for food production lines.

Marker Light Designs – St. Charles, IL 1994 to 2001
PRESIDENT

Designed and constructed scale models and dioramas for museums and corporate clients.

Aurora, Elgin, and Fox River Electric Co. – South Elgin, IL 1984 to 2005
ASSISTANT TRAINMASTER/CAR DEPARTMENT SUPERVISOR/TRAINMAN

Served in various operating and maintenance capacities on a tourist railroad.

Commonwealth Edison Company – Chicago, IL 1981 to 1995
PROJECT MANAGER/CONTROLS ENGINEER/EFFICIENCY ENGINEER

Served in various design, testing, training, and management capacities within utility power plants.

DETAIL OF PROFESSIONAL EXPERIENCE

Medical Device Design, Testing, and Manufacturing Experience:

- Developed and designed new medical products including, electrical/electronic subsystems and mechanical components in accordance with Underwriters Laboratories (UL) and International Electrotechnical Commission (IEC) medical device standards and directives, and Food and Drug Administration (FDA) medical device regulations.
- Conducted lab and clinical studies to evaluate safety and reliability of new product designs.
- Conducted lab tests on defective components for failure mode analysis.
- Wrote engineering bulletins, instruction books, and service manuals for new products.
- Prepared reports, test data, and 510(k) submissions for FDA approval of new products.
- Maintained documentation and quality systems in accordance with FDA Good Manufacturing Practice (GMP) and Quality System Requirements (QSR).
- Drafted specifications, drawings, and claims for utility patent applications.
- Designed manufacturing workstations, hand tools, and assembly fixtures to maximize safety, efficiency, and ergonomics.
- Wrote manufacturing and quality procedures in accordance with FDA regulations.

Power Tool Design and Testing Experience:

- Developed and designed gasoline-powered turf care, horticultural, forestry, and construction tools in accordance with California Air Resources Board and Federal Environmental Protection Agency air pollution regulations. These tools included chain saws, turf and hedge trimmers, leaf blowers, lawn edgers, and rototillers.
- Developed and designed electrically powered products including a line of battery operated turf care, horticultural, and forestry tools.
- Conducted lab and field tests to evaluate the safety, feasibility, and durability of new product designs and design revisions in existing products.
- Conducted lab tests to measure gasoline engine power and exhaust emission levels against regulatory agency emissions standards.
- Prepared compliance test reports for submission to the California Air Resources Board and the Federal Environmental Protection Agency to obtain approval of new product designs and design revisions.

- Conducted forensic analyses for product liability cases.
- Drafted specifications, drawings, and claims for utility patent applications.

Manufacturing/Production Line Design Experience:

- Designed processing machinery, material handling systems, tooling, industrial controls, data acquisition systems, and safety interlocks for manufacturing lines.
- Created mechanical drawings, electrical wiring diagrams, electrical schematics, and control logic.
- Troubleshot electrical systems and mechanical equipment in manufacturing lines.
- Designed manufacturing facilities in accordance with National Electric Code (NEC) requirements and municipal building codes.

Industrial and Consumer Product Development Experience:

- Evaluated electrical components to design printed circuit boards and electro-mechanical devices.
- Designed metal castings, extrusions, and stampings.
- Designed extruded, die-cut, injection molded, blow molded, rotational molded, and vacuum formed plastic parts.
- Created mechanical drawings, electrical wiring diagrams, electrical schematics, printed circuit board layouts, and control logic.

Utility Power Plant Design, Testing, Maintenance, and Operating Experience:

- Designed computerized process control systems for coal-fired boilers, steam turbines, and auxiliary equipment.
- Designed boiler control system safety interlocks in accordance with National Fire Protection Association (NFPA) guidelines regarding furnace explosions.
- Designed equipment control panels and human-machine interface (HMI) stations for safe, ergonomic operation.
- Designed piping systems, storage tanks, and pressure vessels in accordance with rules developed by the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Committee (BPVC).
- Performed system efficiency tests in accordance with ASME Power Test Codes.
- Wrote power plant procedures regarding equipment operations, maintenance, and safety.
- Designed a computerized power plant simulator to train operating personnel to effectively and safely contend with equipment malfunctions and dangerous conditions.
- Managed overhaul, inspection, and repair of boilers, steam turbines, combustion turbines, pumps, coal pulverizers, coal feeders, burners, gas ignition systems, piping, exhausters, condensers, heat exchangers, fans, ductwork, piping systems, coal handling equipment, ash/clinker handling equipment, electrostatic precipitators, generators, exciters, transformers, and instrumentation.

Railroad Experience:

- Performed inspection and maintenance of electric railway equipment, including multiple-unit controls, automatic air brake systems, PCC-type electric braking systems, traction motors, bearings, current collection devices, door controls, and lighting systems.
- Operated steam, diesel, and electric railway equipment in passenger and freight service.
- Developed operating crew training manuals, training classes, and examinations.
- Maintained track, roadbed, electrical substation, and electrical overhead systems.
- Developed drawings and operating manuals for electrical substation wiring, control systems, and electrical equipment.
- Redesigned diesel locomotive control systems to incorporate a radio remote control option for switching service.

Forensic Engineering Experience:

- Photographed and documented evidence and forensic analysis in accordance with Federal Rules of Evidence (FRE) and the Federal Rules of Civil Procedure and Evidence (FRCPE).
- Performed both destructive and non-destructive examinations to analyze evidence collected at fire scenes to isolate and identify the true cause of onset.
- Reconstructed fire scenes to locate point of origin and cause.

SEMINARS AND COURSES PRESENTED

Coal Power Plant Fundamentals - EUCI, Inc./EngineeringExpert.net, LLC

Developed lesson plans and taught a course that provides an overview of a utility power plant, from the coal pile to the electrical switch yard, illustrating the functions and operations of equipment used to generate electricity.

Arc Flash Fundamentals – EUCI, Inc./EngineeringExpert.net, LLC

Developed lesson plans and taught a course for utility power plant personnel. Course content included a discussion of the hazards of exposure to electrical arc flash incidents, OSHA regulations pertaining to arc flash program requirements, NFPA and IEEE standards for arc flash incident energy calculations and personal protective equipment selection, electrical equipment warning label requirements, and arc flash program maintenance.

Turbine Heat Rate Testing – Commonwealth Edison Production Training Center

Developed lesson plans and taught a course for utility power plant engineers and technicians. Course content included methods for setting up and performing steam turbine efficiency tests in accordance with ASME Power Test Codes and turbine manufacturer guidelines. Taught lessons in practical thermodynamics, heat transfer, and fluid mechanics in the context of power plant efficiency testing.

Transformers – Commonwealth Edison Personnel Development Department

Taught lessons in theory, design, and operation of single phase and three phase high voltage utility transformers.

Problem Solving, Decision Making and Planning Seminar – Commonwealth Edison Personnel Development Department

Developed and presented a series of seminars for supervisory and non-supervisory corporate personnel. Course content included methods to identify true causes of problems and develop decision-making strategies to correct the problems.

First Line Supervisor Training – Commonwealth Edison State Line Station

Developed lesson plans and taught a course for utility power plant management personnel. Course content included lessons in leadership, supervisory skills, administrative procedures, operating procedures, maintenance procedures, and safety procedures.

FILM AND MEDIA EXPERIENCE

Listed as a subject matter expert in the Illinois Film Office, *Film Guide Book*. Listed subject matter expertise includes: power plants, railways, tunnels, bridges, industrial equipment, and industrial archeology. Experience in the following television and radio productions:

Curious and Unusual Deaths, New Road Media/Discovery Channel

Appeared on the television program as a subject matter expert regarding a district heating system steam piping failure; electrocution caused by contacting a high voltage capacitor in a

microwave oven; death caused by carbon monoxide emitting from a propane heater; and electrocution caused by an electrical fault in an air conditioning system.

Understanding: Tunnels, Cronkite Ward Television/The Learning Channel

Appeared on the television program as a subject matter expert with regard to the design and operation of Chicago's abandoned narrow gauge freight subway system.

ER, Warner Brothers Entertainment, Inc.

Acted as a technical expert to assist the writers in developing a plot for an episode set in Chicago's abandoned narrow gauge freight subway system.

Urban Explorers, Hoggard Films/Discovery Channel

Acted as a technical expert to assist the writers of this television series in developing a plot for an episode documenting Chicago's abandoned narrow gauge freight subway system.

Cities of the Underworld, Authentic Entertainment, Inc./History Channel

Acted as a technical expert to assist in writing and producing a television series episode documenting the exploration of Chicago's abandoned narrow gauge freight subway system.

History's Mysteries, Lion Television/History Channel

Acted as a technical expert to assist the writers for an episode concerning a Denver Tramways streetcar body that was discovered within the structure of a private home near Denver, Colorado.

PUBLICATIONS

Philip J. O'Keefe, PE, The Engineering Expert Witness Blog (2008 - Present)

(<http://www.engineeringexpert.net/Engineering-Expert-Witness-Blog/>)

A weekly blog focused on engineering-related topics. Specific focus is paid to select technical problems and their solutions through a variety of approaches.

Philip J. O'Keefe, PE, A Case Study of the Systems Engineering Process in FDA Class II Medical Device Design, Iowa State University of Science and Technology, Ames, Iowa, 2008.

A paper describing how a systems engineering approach was used to develop a new Food and Drug Administration (FDA) Class II medical device. It presented a case study of the systems engineering process and how it was used to ensure that a medical device design met all project stakeholder requirements, including a requirement for regulatory compliance.

P. J. O'Keefe, Fossil Turbine Heat Rate Testing, Commonwealth Edison Company, Chicago, 1984.

A manual written to train utility power plant engineers and technicians in setting up and performing steam turbine efficiency tests in accordance with ASME Power Test Codes and turbine manufacturer guidelines. The manual also guides engineers in setting up thermodynamics, heat transfer, and fluid mechanics calculations to process test data, analyze test results, and report test results.

P. J. O'Keefe, J. J. Mulligan, Technical Staff Handbook, Commonwealth Edison Company, Chicago, 1983.

A handbook written to guide utility power plant engineers in performing tests, inspections, and analyses of problems on coal fired boilers, steam turbines, blowers, pumps, heat exchangers, piping, coal handling equipment, electrostatic precipitators, dust handling systems, water demineralizers, and chemical injection systems.

P. J. O'Keefe, S. Braun, Bailey "C" Programming, Commonwealth Edison Company, Chicago, 1990.

A design guide to provide basic understanding of the "C" programming language and how to upload

“C” programs into a Bailey Network 90 Distributed Control System to automatically control utility power plant systems including coal fired boilers, steam turbines, and auxiliary equipment.

P. J. O'Keefe, *State Line Station Locomotive Number 1*, Stateliner Magazine, Commonwealth Edison Company, 1984.

An article describing the construction, specifications, and operating principals of the world's largest and most powerful electric battery operated locomotive and how General Electric based the concept for this locomotive on technology used in World War I submarines.

SEMINARS AND CONTINUING EDUCATION WORKSHOPS

Patent Enforcement and Defense – Minnesota State Bar Association Continuing Legal Education

Guidelines for pre-suit investigations, the impact of KSR v. Teleflex on the TSM Obviousness Test, assessing the impact of statements made during Markman hearings, and trends in claim construction.

Effective Development and Presentation of Expert Witness Testimony – Law Seminars International

Preparing expert reports, retaining files and evidence, using persuasive techniques during testimony, responding to questions of opposing counsel, using graphics and models during testimony, and complying with Federal Rules of Evidence, Federal Rules of Civil Procedure, and ethical standards.

Patent Education Series – Intellectual Properties Enterprises, Inc.

Understanding the regulations, laws, and procedures contained within the Manual for Patent Examining Procedure (MPEP), and how they govern the US Patent and Trademark Office.

Strategies for Successful Presentations – Xerox Learning Systems

Written Communications Seminar - Commonwealth Edison Production Training Department

Basic Instructor Course - Commonwealth Edison Production Training Department

Developing lesson plans and effective presentation skills.

Advanced Instructor Course - Commonwealth Edison Production Training Department

Developing lesson plans and effective presentation skills.

Test Construction Seminar - Commonwealth Edison Production Training Department

Creating effective exams to test and measure students' understanding of training topics.

Interpersonal Management Skills Seminar – Xerox Learning Systems

Systematic Trouble Shooting – Business Processes, Inc.

Applied Systematic Problem Solving, Decision Making and Planning Program – Business Processes, Inc.

Kepner-Trego Problem Solving/Decision Making – Kepner-Trego, Inc.

Stress Management: A Positive Strategy - Commonwealth Edison Personnel Development Department

Situational Leadership/One Minute Manager Training Program – Commonwealth Edison Personnel Development Department

Time Management Seminar - Commonwealth Edison Personnel Development Department

Principles and Fundamentals of Human Relations As Applied To Selling, Supervising, and Managing – Sales Analysis Institute, J. D. Kirk Associates, Inc.

Role of the Manager/Gaining Acceptance - Commonwealth Edison Personnel Development Department

Management Coaching Seminar - Commonwealth Edison Industrial Relations Department

Vibration Monitoring and Analysis Training Program – IRD Mechanalysis, Inc.

Analyzing rotating machinery to identify and eliminate the causes of mechanical vibrations.

Boiler Control Course - Instrument Society of America

Developing control system strategies and designing control logic for coal-fired boilers, oil-fired boilers, gas ignition systems, oil ignition systems, and auxiliary equipment.

Burner Management Seminar – Westinghouse Electric Corporation

Designing fuel system safety interlocks for large utility power plant boilers in accordance with National Fire Protection Association (NFPA) guidelines, for the prevention of explosions.

Pulverized Coal Boiler Design and Operations Seminar - Combustion Engineering, Inc.

Designing and operating utility power plant pulverized coal boiler equipment, including coal pulverizers, exhausters, coal pipes/orifices, coal feeders, burners, gas ignition systems, balanced furnace draft systems, boiler tubes, steam drums, circulating water systems, combustion control systems, and safety interlocks.

Boiler Performance and Maintenance Seminar - Babcox and Wilcox, Inc.

Monitoring and evaluating coal fired boiler performance, conducting inspections, performing equipment tests, and analyzing test data to recommend maintenance procedures.

Systems, Controls, and Operations for Large Steam Turbine Generator Mechanical Hydraulic Control Units – General Electric Apparatus and Engineering Services.

Designing and operating General Electric utility power plant steam turbine equipment including blades, shrouds, diaphragms, nozzle blocks, throttle valves, steam chest, stop valves, intercept valves, hydraulic controls, condensers, extraction lines, generators, and exciters.

Steam Turbine-Generator Maintenance Course – Westinghouse Electric Corporation

Overhauling, inspecting, and repairing Westinghouse utility power plant steam turbines and generators.

Power Plant Performance and Maintenance – Power Safety International

Predicting failure of utility power plant equipment through performance testing and analysis of test results.

Honeywell TDC 2000 Distributed Control Systems – Honeywell Corporation

Designing analog block logic, digital ladder logic, human-machine interface (HMI) graphics, wiring, and hardware for distributed control system (DCS) applications.

Bailey Net 90/Infi 90 Distributed Control Systems – Bailey Controls Corporation

Designing analog block logic, digital ladder logic, HMI graphics, wiring, and hardware for DCS applications.

Westinghouse Distributed Process Family (WDPF) Control Systems – Westinghouse Electric Corp.

Designing analog block logic, digital ladder logic, HMI graphics, wiring, and hardware for DCS applications.

Westinghouse Distributed Process Family (WDPF) Control System Maintenance Course – Westinghouse Electric Corporation

Troubleshooting DCS software and hardware problems.

Westinghouse HPPC Programmable Logic Controllers – Westinghouse Electric Corporation

Designing digital ladder logic for process control applications.

Square D SY/MAX Programmable Logic Controllers – Square D Company

Designing digital ladder logic for process control applications.

Allen-Bradley Programmable Logic Controllers – Allen-Bradley, Inc.

Designing digital ladder logic for process control applications.

Engineering Fluid Mechanics Seminar – Commonwealth Edison Production Training Department

Designing piping systems, determining pump capacity, conducting pump performance tests.

Power Plant Steam and Mechanical Fundamentals - Commonwealth Edison Production Department Training

Operating coal fired boilers, steam turbines, and auxiliary equipment in utility power plants.

Steam Boilers and Auxiliaries - Commonwealth Edison Industrial Relations Department

Operating utility power plant coal and oil fired boilers and auxiliary equipment including coal pulverizers, stokers, cyclone burners, oil atomizers, natural gas ignition systems, coal feeders, induced draft and forced draft systems, boiler tubes, steam drums, circulating water systems, precipitators, coal handling systems, and ash/clinker handling systems.

Power Plant Chemistry Fundamentals – Commonwealth Edison Production Department Training

Designing, operating, and testing water filters, ion exchange systems, chemical injection systems, and acid/caustic storage systems used in treating utility boiler feed water.

Quality Assurance Training - Commonwealth Edison Industrial Relations Department

Understanding quality assurance procedures and auditing methods used in utility power plants.

Electrical Power System Survey Course - Commonwealth Edison Industrial Relations Department

Designing and operating electric utility three-phase high voltage transmission and distribution systems including switching systems, disconnects, circuit breakers, fuses, insulators, protective relay systems, power factor control, transformers, and supervisory control and data acquisition (SCADA) systems.

Computer Training – Various training resources.

Basic and advanced classes in DOS, UNIX, MS Windows, MS Word, MS Excel, MS PowerPoint, MS Access, BASIC, FORTRAN, "C", HTML, Java, Dbase, Word Perfect, AutoCAD 2000, and OrCAD.

OTHER ACCOMPLISHMENTS AND INTERESTS

Professional Scale Model Building:

- Constructed highly detailed, museum quality 1:12 scale model dioramas of a narrow gauge electric railway equipment for display at Chicago's Field Museum of Natural History. The model parts were fabricated from plastic, brass, and wood, based on my personal drawings taken from field measurements.
- Worked with administrators at Chicago's Museum of Science and Industry to repair and restore a large model railroad exhibit and develop new dioramas for the museum's coal mine exhibit.
- Constructed museum quality 1:48 scale models of modern railroad freight cars for display in a traveling exhibit sponsored by Norfolk Southern Corporation. The model parts were fabricated from plastic, brass, and wood, using scale drawings and paint stenciling diagrams supplied by the client.
- Designed, machined, and fabricated brass patterns to manufacture white metal castings for 1:24 scale models of a narrow gauge electric mining locomotive. The patterns were based on my personal drawings developed from field measurements.
- Constructed 1:87 scale model displays of modern railroad freight cars for the Excel Railcar Corporation.
- Received the Dremel Award for authoring an article in *Railroad Model Craftsman Magazine* which describes the construction of a 1:87 scale Chicago streetcar model.

Visual Arts:

- Served as staff artist for the Shore Line Interurban Historical Society magazine, *First and Fastest*.

- Created dust jacket artwork for the book *The "L", The Development of Chicago's Rapid Transit System, 1888-1932*, by Bruce Moffat.
- Produced scale drawings and shot photographs for the book *The Chicago Tunnel Story – Exploring the Railroad Forty Feet Below* by Bruce Moffat.
- Recognized by juried art shows and galleries as a fine artist working in watercolor, pen and ink, and pencil media.
- Designed and created jewelry using various techniques, including photo-chemical etching and lost wax casting.
- Created sculptures using various glass blowing techniques.

Industrial Archeology:

- Recognized as an authority on American railroad artifacts, particularly uniform accoutrements, keys, locks, signal lanterns, and other hardware used on electric railways in the early 20th Century. Authored numerous articles for *Key, Lock, and Lantern Magazine*, a publication for collectors of railroad memorabilia.
- Recognized as an authority on Edison cylinder and disc phonographs and records manufactured between 1900 and 1929. Presented historical lectures and phonograph demonstrations at schools and public events. Created the *Edison Phonology* website to present historical information about Edison phonographs and records. Currently serve as moderator on the *Old Time Victrola Music Message Board*, an internet forum for the discussion of topics regarding acoustical phonographs, acoustical recordings, and early electric recordings manufactured prior to 1935.
- Recognized as an authority on the Chicago Tunnel Company, a common carrier narrow gauge electric freight railway that operated under the streets of downtown Chicago from 1904 until abandonment in 1959. Provided historical and technical information for the book *The Chicago Tunnel Story – Exploring the Railroad Forty Feet Below* by Bruce Moffat. Created the *Chicago Tunnel Company Railroad* website to present historical subject matter. Presented historical lectures and slide presentations on the Chicago Tunnel Company at museums and public events.